

the Apothecary's use, this Gold, that was without the help of Salts reduc'd by beating to a sufficient thinness ( insomuch that seventy odd Leaves did not weigh a scruple,) I found (more than once) upon putting two or three times the weight of our Mercury to them, that a smart heat was presently produced in my hand.

*& Aurifabri; hoc Aurum, quod citra salium opem tundendo redactum erat ad tenuitatem sufficientem ( adeo ut ultra septuaginta folia vix unius scrupuli pondus aequalarent,) hoc, inquam, Aurum comperi (unâ vice pluries,) cum binum trinumve Mercurii nostri pondus ipsi commiscerem, infinem in manu mea calorem mox peperisse.*

*Some Observations, sent by an Anonymous to the Publisher, on several Passages in the two last Months Transactions, relating to some, till now un-observed, Qualities of the Air; to the Mixing and Fermenting of Liquors in vacuo; to the History of Birds; the Anatomy of the Trunks of Vegetables; Baroscopes, &c.*

Honoured Sir,

**H**aving long understood the freedom of address, you have allowed to any candid and unprejudic'd persons, whose general good wishes to the Common-wealth of Learning make 'em ambitious to impart something, whereby they may promote the Empire of Man above other Creatures; I flatter'd my self, it would be no unpardonable presumption, to communicate some of my thoughts unto you, on such a subject, as that the usefulness of the matter may keep me from seeming altogether impertinent, and the smallness of my performance, argue the greatness of my desires to serve you. This I resolved to do by way of Animadversions on the two last *Philosophical Transactions*; and though I performed nothing more, I hop'd at least, my Observations may do them the kindness, as shades intermixt with light, to render them more conspicuous. In hopes of this, I shall draw up my thoughts under this general Title of *Some Philosophical Observations on some passages in the two last Months Transactions*, viz. for Decemb. and January.

I highly applaud the bold design to discover some, till now unobserved, Qualities in the Air; and, though the difficulty of the Subject, and modesty of the Honourable Person, less expected in

so great a Philosopher, and so experienc'd a Chymist,) induce him to call them *Suspicious*, yet the grounds he produces seem to raise them to the priviledges of *Assertions*: And though, as a late Observer on these Tracts saies on the same subject, 'tis only for the Sons of Art to make such discoveries, and indeed the difficulty appropriates it to them; yet the meanest person may enjoy the benefits of such performances, as we find in the discovery and use of the *Magnetick Needle*. For, it cannot be imagined, what immense profit may follow the knowledge of agreement between some Celestial and Terrestrial Bodies; strange effects will be then as easily produced, as now they are difficult to imagine. And truly this never enough celebrated Author, in his late Essay of *Historical relations, Observations and Experiments of Celestial and Aerial Magnets, the growth of Mettals in their Oar exposed*, (they say Corn will so increase in Mow's by sweating, and Coals in heaps) and *these Experiments*, seems to have put it out of doubt, that there are some Hidden qualities in the Air: But still the question returns, what they are; what their peculiar Effects and Causes; and I fear, these will long continue but *Suspicious*.

My design in this Paper (because the place of my residence at present denies me conveniences for attempting the other kind of proof) is, to manifest *a priori*, that such *Suspicious*, and their grounds, the *Experiments*, may be reconciled to some received Theories: And as it is the business of the Honourable person to shew, they are highly countenanced by *Experiments*; so it shall be mine, to make it appear, they are consistent with *Hypotheses*, and with the Nature of the bodies in which they are presumed to reside.

Corrosions of bodies, especially with a sensible motion, by emitting *effluvia*, which may also be springy themselves, if saline, may further bend the springy particles of the Air, giving it a greater *Elatery*. On the contrary, other corrosions not so emitting, by different waies may weaken this spring; which effect, though at first sight it may seem irreconcileable, may be less impossible, if we conceive the particles of the corroding liquor or *menstruum*, of such a penetrating and dividing nature, (the Essay of *Effluviums* manifesting there are such,) as by cutting or wearing of the ramous or stiff parts of the Aerius corpuscles, which thus being smaller, lose their bent, and become better qualified

to be extruded out of the glass, which leaving the other particles free from their pressure, consequently render them more at liberty, and less springy. And this may have an interest in rarefaction of the Air, by what cause soever, as heat, cold, or taking away the usual pressure, &c.

I am not ignorant of what the excellent Author has delivered of the Imperviousness of Glass to Air; but then he means the true springy Air, not that, which we suppose by its minuteness to have lost its spring; and the particles of the Air in relation to their respective magnitude, may be compared to bullets, shot, and sand mixt together: Or this corrosion may precipitate some part of the Air; which opinion they would favour, who suppose its particles Nitrous. 'Tis also easie to think, that the Air being a Rendezvous of so many Corpuscles, and consequently so heterogeneous a body, may be diversly qualified by admitting *Effluvia* from solutions, which may remain unactive, till they meet with some body predisposed to receive their operation; which ignorance of the cause, and unexpectedness of the event (seeing it did not a&t on other bodies,) makes strangely admirable.

In the first Experiment, the solution may acquire a brown colour by the *menstruum's* imbibing the particles of Copper into it self, which would alter its texture; and the impeding particles, diversifying the refractions and reflections, may modifie the rays of light; or, as it is in Mr. *Newton's* Theory, the solution may be qualified only to admit such raies whose degrees of refrangibility, and mixture with other raies, may be predisposed to give a Brown, (to shew what mixture or refraction makes this particular colour, I have not at present Mr. *Newton's* Theory by me;) to which effect the Air did much contribute: But how far this and the following Experiments of the producing of Colours may countenance the ingenious Mr. *Hook's* Hypothesis, of Colours being made by the various concave surface of the reflecting Air, I recommend to further inquiry. Nay, the Air may be much concerned in the solution it self, since it is allowed to be an Universal *menstruum*, at least of all Sulphureous bodies; and I wish it had been recorded †; Whether that solution was not something sooner made in the free Air, than in the Glass with the *hermetical*

<sup>†</sup> The Noble Author here meant, did purposely forbear to do what is here proposed, because he was aware of the difficulty of determining it.  
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stopple (I hope I may call it so, since 'tis as close as the seal.) The *Spirit of Salt* may be saturated, its force spent, and vainly expect relief from the fresh Air, which the unkindness of the stopple denies. This removed, it may acquire its former quality by degrees, as the fresh Air did lower intrude it self: It may again lose it by being unassisted, and let the particles precipitate, if any such effect is observed; or the equilibration of the Air (for here 'tis not recorded, whether the Spring was weaken'd or no,) may contribute to sustain the filings up in *æquilibrio*. If it long continue its commerce with the free Air, it may be enabled to continue its colour by having a more perfect mixture with the filings by the operation of the Air.

So perhaps in the *second* Experiment the delay of regaining was to be imputed to the cold or moisture, or other critical circumstances of the Air, having less of those dissolving particles which make it a *menstruum* on those bodies.

In the *third* Experiment, beside the former Observation, 'tis obvious to think, that the included spirit having spent its former force, may exercise some contrary quality on the bodies, enabled thereto by its heterogeneity; nay, upon the readmission of the Air, some of the Spirit of Filings may evaporate into the Air, which could not extricate it self till helpt by that universal Solvent; so an alteration is made without a precipitation or sediment.

In the *fourth* Experiment, the time of the year may add some quality to the Air, which thereby may act on the Saline spirit, by adding to it, or imbibing it, or invigorating it to evaporate, nay out of the Glass, if the parts are extremely comminuted.

And these things, however extravagant, are not difficult to imagine, and where the Experiments are but subservient to Suspicion, an hint of the possible cause of them *à priori* (since we know nothing of Nature that way, but by gheffing its operation, as it, by Trials, represents it self to our weak apprehension) will be pardonable, if but just removed from extravagance.

In the ensuing Trials, the weaken'd Spring is especially observed where the Mercury in the seal'd leg was depressed, because the Spring in the Conical glass and open'd leg yielded by being weaken'd; which invigorated again, reduced it self to an *æquilibrium*. The Liquor in the *sixth* Trial acquired a Blew colour, which, according to Mr. *Newton*, is the result of the perfect mixture

ture of those raies , which according to their degrees of refran-  
gibility are dispos'd to exhibit a Yellow and Green colour ;  
which he declares by the instance of those two Powders mixt.  
Now , whether this Hypothesis, or Mr. *Hooke's*, or that of *Def-  
cartes's*, or the *Atomist's*, may be most favoured hereby , I leave as  
an Inquiry , viz. Whether Colour is most referable to the pre-  
disposition of the Raies and internal texture ; or the concave sur-  
face of the refracting and reflecting Air ; or to the surface of the  
body , which diversly modifies the Corpuscles or Raies of  
light.

But in my simple judgment, the busines will not bear a contro-  
versie, since each of these *may have*, nay certainly *has* a distinct in-  
terest in the phænomena of Colours, and the losing of the blew for  
transparent, and regaining it again by the Air's re-admission, seems  
to countenance the interest of the Air, which may be alter'd by lo-  
sing some parts in operating on the Solution. The obviating of  
the objection of the powder remixt so regaining the colour, shows  
at once the ingenuity of the Author in taking notice of it, and the  
insufficiency of the Objection it self to challenge the effect from the  
Air. The mild operation of *Spirit of Vinegar* on *minium*, may not  
change the Air's spring, by extricating springy air out of the Vi-  
negar to supply that it had imbibed, as it did an elastical substance  
in the notes. The diversity of the operation of *Sal Armoniac* might  
be refer'd to the strength of the Spirit ; so may the quick-  
ness and length of retaining the colour, and slowness of losing it ;  
the weaknes proceeding from the Air imbib'd, or dividing some  
of its particles to extrude them, as I noted before : In all which,  
critical times and qualities may be concern'd, which my weakness  
cannot examine ; but hope, these Observations, as that Honourable  
perfon's Experiments, will give rise to further inquiries.

Those Ingenious *Frenchmen*, excited by Mr. *Boyle*, the Glory of  
Learning, as well as of our Nation, having given us an attempt of  
mixing and fermenting liquors *in vacuo*, do prosecute Fermentation,  
particularly of that in the growth of plants ; how it may be im-  
peded or promoted by the absence or presence of the Air. As for  
their taking the Receiver off from the Engine, I suppose, it could  
not be shaken but in the very moving *some* Air must get in, not  
so much, as sensibly to manifest it self in the Mercury, though suf-  
ficient

sufficient to disturb the Experiment in Plants, and preservation of bodies, especially when added to the Air extricated from those bodies : And I the rather favour this suspicion, because all the bodies were something putrified, which Mr. Boyle's exacter Experiments prevented. These Experiments further illustrated, will add much to the opinion of Respiration of Plants, and motion of their juices by the Air. The water through the trunk forms bubbles, because it meets with the Air in those pipes ; through the leaves, only mild drops by a simple percolation.

In the continuation of *January*, by which and what Mr. Boyle has writ, we see the nature of the Air, its effects on bodies when present; by procuring its absence. Now Sir W. Petty can no more complain at the idle employment of Weighing Air ; for the doctrine being well illustrated, and the Theory established, we thus descend again to more useful and grounded Experiments; as the method mentioned by my Lord Bacon, to proceed from Experiments to Axioms and Assertions; from these, as too general, to particular and useful Experiments, which before we could not do, till we had clear'd the Doctrine from wide and extravagant gheses.

Fruits are neither exactly preserved in the free Air, nor quite without it ; *that* too much exciting the prædatory Spirits to consume the more solid substance ; the want of Air hurting them as much as it hinders Vegetation ; which is obscurely performed in all conserved Fruits, the stem or externals supplying the office of the root : But Fruit is better in conservatories, where there is Air enough to nourish, but not to consume them. *Pag. 494*, where the *Cherries* are mentioned to be corrupted in less than an hour, when taken out of the *vacuum*, that may be referred to the exalted Spirit, which avolated on the first salute of the Air : That *Bread* yielded no Air, may be imputed to the open pores : That *Beef* yielded much springy Air, to the strong Saline spirit in the flesh.

The industrious Author of the *History of Birds* gives me occasion to wish, that some other would undertake that of other Creatures (the Preface seems to promise something, from that noble Author, of *Animals*,) as *Minerals, Insects, Fishes, &c.* reducing them to their Classes with Philosophical Observations, useful to illustrate many passages in Experimental Philosophy.

Where

The diligent Dr. *Grew* having given us an *Idea of a Phytological History*, and the *Absolute and Comparative Anatomy of Roots*, with the Theory of their Vegetation grounded thereon, here proceeds to *Trunks*; who, with the justly famous Signior *Malpighi*, hath discovered a new Philosophical Country, which to the Ancients seemed barren, whose negligence would give it no other Name than that of *Terra incognita*. And, though I cannot but commend the prosecuted Analogy of *Plants* with *Animals*, in their Juyces and Vessels, that by those names of things well known in Animals they might be better understood; yet I would presume to suggest, that the Analogy should not be continued too far, as some have done to the asserting the Circulation of their Juyces, and perfect Organical Respiration, not considering, that the Variety of Nature may as much, nay more than the Constancy, make for her commendation. The Solar and Lunar motion of some Plants, may be another suspicion of some latent qualities in the Air, and by their comparative Anatomy, as in the Spagyrical Anatomy of *Colcothar, &c.* noting what they have more or less than other bodies not so affected, we may search out the cause of their Celestial or Aerial Magnetism.

By the *R. Almanack* we see, 'tis the ingenuity of this Age, that being freed from the slavish opinion of the government of the Planets, they cancel their power in Events, and shew their operation on the masses of Matter, and some peculiar sympathizing bodies, as in the *Essay of Hidden qualities in the Air*; which is the true end and perfection of Astrology, and Natural Magick.

By accurate *Baroscopes* we may regain that knowledge which still resides in Brutes, and we forfeited by not continuing in the open Air, as they do for the most part, and by Intemperance corrupting the *crafs* of our senses. I remember, *Kircher* in his description of *China* speaks of a Stone, (how true I know not) which being made into a Human shape, by nature or art, by change of Colour prognosticates Fair or Foul weather.

I am sorry we were deprived in great part of Mr. *Flamstead's* Observations by the interposition of the Clouds, as if the modesty of *Diana*, though twice eclipsed, had scarce thought it enough to hide her self, from so acute a Discoverer.

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Besides the waies the Ingenious Dr. *Willis* (of whose los's we are already sensible,) mentions, and all Pestilential particles of the Air ; the Lungs might be discomposed by the variation of the Pressure of the Air, and the Impotency of the internal to resist it, or the weakned Spring of the external , and Elatery of the internal Air. By these performances we may rationally apply this Theory to particular Diseases, and descend to them , since we know something à priori ; but still with respect to the Constitution, Diet, Country, Education,&c. of the Patient.

By the *Germans* Essaies we may perceive the acknowledgment, our Neighbours make, or ought to make, of being awaken'd by the *English* to these Discoveries.

I cannot understand, why the Learned Dr. *Moor*, famous with us at *Cambridge*, should reduce so many effects to any Principle distinct from the settled Laws of Nature and God's Providence, but that he is too much devoted to the Notions of the *Platonists* (as appears in all his Writings,) and other of the Ancients , that held the World *animate* ; and this Spirit of Nature to be the Soul or Deity of it : For never any supposed both God and this Spirit. This explication of effects is no more than to say , 'tis produced by an Universal cause, as the Sun hardens Clay , softens Wax, &c. But me thinks, he might have told us , how it acts , or what Natural means it uses.

Now to give you some *promiscuous* Observations as they occur to my memory : I have at *Cambridge* some of those *Star-stones*, Mr. *Lister* mentions in these Tracts , with such joyns , found in a Brook near *Harborow* in *Leicestershire*. There are also some *Thunder-stones* like the heads of Arrows, which being rub'd emitted a Sulphureous odour. Lately in *Shropshire* , where I found these Stones , I took notice of a Shell impressing its signature on the Earth, which began to petrifie within it and look shelly. And I may suggest the Inquiry, whether those Shells which are found in the ground, and seem to argue the Sea was once there , are not such Geometrical effects of Nature, either by a Seminal principle from the Shells decaying, or the effects of the Accidental impressions from some Shells which came thither by accident. And this Doctrine might be much illustrated by some passages in the *Essay of the Origin of Gems* , receiving a signature when they and the Minerals

Minerals are in *Solutis principiis*; which Doctrine, as also that of Cold, Colours,&c. I wish the Honourable Person would comprehend in short †, as he has done his opinions of the Air, in the plain but elegant *Essay of Suction*, which hath procured many Votaries to his Doctrine.

*ticulars, were not yet sufficiently looked into, for him to frame positive Hypotheses of them.*

And it were to be wished, Mons. *Le Grand*, who pretends to write for the Students of the University of *Cambridge*, (of which I must acknowledge my self an unworthy Member,) would take in Mr. *Boyle's*, Dr. *Willis's*, and other Moderns Observations and Experiments, to illustrate Mons. *Descartes's* Doctrine; for it never was the design of this Ingenious Person, to have his writing Systematical, or think he had given us a Body of Philosophy, as M. *Le Grand* seems to make him; but rather upon some few Experiments he has rais'd a general Hypothesis, which is to be promoted or confuted by ensuing Experiments. But our late Author is so far from assuming Modern discoveries, that in his Natural history, speaking of the Elatery of *compress'd Air*, he seems purposely to have declin'd (for he could not be ignorant of so famous a doctrine,) mentioning the Spring of the *Free Air*: Though he lik'd not the opinion, at least he might have considered and explicated it to instruct the younger, without his applause or approbation.

Lately at *Cambridge*, at the dissection of a lusty Country-Curr, I observ'd two Spleens, the Vessels of the lesser, (though there was no great difference,) coming out of those of the greater. The Dog was long a dying, and had exceeding strong Lungs. The like may be usual to the Curious, though I never read of the like Observation.

*+ This perhaps had been done, if this Author had not thought, that several of these Subjects, about which he hath deliver'd divers Historical par-*